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EXAMINER	
HSIEH, HSIN YI	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/587,666	BAUR ET AL.	
	Examiner	Art Unit	
	Hsin-Yi (Steven) Hsieh	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 October 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-22* is/are pending in the application.

4a) Of the above claim(s) *10* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-9 and 11-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 October 2010* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *20100826,20101007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statements (IDS) submitted on 08/26/2010 and 10/07/2010 are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statements are being considered by the examiner.

Drawings

2. The drawings are objected to because Fig. 1A seems to indicate that 9 includes 9a, 10, and 9b, but in fact 9 only includes 9a and 9b. Please change Fig. 1A similar to Fig. 2A showing that 9 includes only 9a and 9b. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

3. **Claims 1, 3-9, and 11-22** are objected to because of the following informalities: Claim 1 recites "wherein at least one layer ... is embedded in the current expansion layer" in the 10th to 12th lines of the claim, which is not consistent with the figures. "Embed" means "to fix into a surrounding mass" (Random House Dictionary, © Random House, Inc. 2010). Fig. 1A shows that at least one layer of 10 is "sandwiched" in the current expansion layer 9a and 9b, and not "embedded" in the current expansion layer. It is recommended to replace "embedded" by "sandwiched". Appropriate correction is required. Claims 3-9 and 11-22 are objected because they depend on the objected claim 1.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. **Claims 1, 3-9, and 11-22** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claim 1 recites the limitation "a two-dimensional electron and hole gas" in the second last line of the claim. It is unclear whether this limitation is the same as the limitation "a two-dimensional electron gas or hole gas" recited in the 9th line of the claim.

7. Claims 3-9 and 11-22 are rejected because they depend on the rejected claim 1.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. **Claims 1, 3, 4, 6, 8, 11, 15 and 22** are rejected under 35 U.S.C. 102(b) as being anticipated by Nagahama et al. (US 2004/0004223 A1) as can be understood since claims 1, 3-9 and 11-22 have been rejected under 35 U.S.C. 112.

10. Regarding **claim 1**, Nagahama et al. teach a thin-film LED (light emitting device; Abstract) comprising: an active layer (4; Fig. 1, paragraph [0072]), which (4) emits electromagnetic radiation (intrinsic property of LED; paragraph [0072]) in a main radiation direction (upward direction in Fig. 1 as implied in paragraph [0072]); a current expansion layer (p-side cladding layer 5; ; Fig. 1, paragraph [0072]), which is disposed downstream of (above) the active layer (4) in the main radiation direction (upward direction in Fig. 1) and is made of a first nitride compound semiconductor material (first layer of $In_XGa_{1-X}N$ ($0 \leq X \leq 1$); paragraph [0074]); a main area (the top surface of 7; Fig. 1, paragraph [0072]), through which the electromagnetic radiation (light) emitted in the main radiation direction (upward direction in Fig. 1) is coupled out (see Fig. 1, paragraph [0072]); and a first contact layer (p electrode 8; Fig. 1, paragraph [0072]) arranged on the main area (the top surface of 7), wherein a transverse conductivity of the current expansion layer (5) is increased by formation of a two-dimensional

electron gas or hole gas (the hetero-junction of supper lattice can form either a two-dimensional electron or hole gas under suitable biasing, and the increase in transverse conductivity is an intrinsic property of formation of the two-dimensional electron or hole gas), and wherein at least one layer (second layer of 5; paragraph [0073]) made of a second nitride compound semiconductor material ($Al_YGa_{1-Y}N$ ($0 \leq Y \leq 1$); paragraph [0074]) having a larger electronic band gap than the first nitride compound semiconductor material (paragraph [0074]) is embedded in the current expansion layer (5; i.e. laminated in the order of 1st layer, 2nd layer, 1st layer and so on; see paragraph [0073]) to form a two-dimensional electron gas or hole gas (the hetero-junction of supper lattice can form either a two-dimensional electron or hole gas under suitable biasing) in the current expansion layer (5).

11. Regarding **claim 3**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, wherein a plurality of layers (second layers of 5; paragraph [0073]) made of the second nitride compound semiconductor material ($Al_YGa_{1-Y}N$ ($0 \leq Y \leq 1$); paragraph [0074]) are embedded in the current expansion layer (5; i.e. laminated in the order of 1st layer, 2nd layer, 1st layer and so on; see paragraph [0073]).

12. Regarding **claim 4**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, wherein the at least one layer made of the second nitride compound semiconductor material (second layers of 5; paragraph [0073]) comprises a number of layers (second layers of 5; paragraph [0073]) made of the second nitride compound semiconductor material ($Al_YGa_{1-Y}N$ ($0 \leq Y \leq 1$); paragraph [0074]), wherein the number of layers is between 1 and 5 inclusive (can be one in a supper lattice of two layers; paragraph [0073]).

13. Regarding **claim 6**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, wherein the first nitride compound semiconductor material is GaN ($In_XGa_{1-X}N$ ($0 \leq X \leq 1$) with X=0; paragraph [0074, 0131]).

14. Regarding **claim 8**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, wherein the at least one layer (second layers of 5; paragraph [0073]) made of the second nitride compound semiconductor material (AlGaN layer which can be the second layer; paragraph [0165]) has a doping (Mg doped; paragraph [0165]), a dopant concentration (intrinsic property of doped regions) being higher in the regions adjoining (connecting) the current expansion layer (5, i.e. the regions in direct contact with the doped GaN layer) than in a central region of the at least one layer made of the second nitride compound semiconductor material (i.e. a central region of the second layer of doped AlGaN layer; GaN layer is doped with greater amount of impurity than AlGaN layer, which means the center region of AlGaN layer has a lower doping than the edge of the AlGaN layer for some of dopants form GaN layer can diffuse from the higher doping GaN layer to the lower doping AlGaN layer at the edge of the AlGaN layer; paragraph [0165]).

15. Regarding **claim 11**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, wherein the active layer (4) includes $In_xAl_yGa_{1-x-y}N$ where $0 \leq x \leq 1$, $0 \leq y \leq 1$ and $x+y \leq 1$ (InGaN, i.e. $In_xAl_yGa_{1-x-y}N$ with y=0; paragraph [0072]).

16. Regarding **claim 15**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, wherein the first contact layer (p electrode 8) comprises no aluminum (p-electrode consisting of Ni and Au; paragraph [0372]).

17. Regarding **claim 22**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, wherein the current expansion layer (5) includes two partial layers (two first layers; paragraph

[0072]) made of the first nitride compound semiconductor material (first layer of $In_XGa_{1-X}N$ ($0 \leq X \leq 1$)) separated from one another by the at least one layer made of the second nitride compound semiconductor material (second layers of $Al_YGa_{1-Y}N$ ($0 \leq Y \leq 1$)), i.e. laminated in the order of 1st layer, 2nd layer, 1st layer and so on; paragraph [0073]).

Claim Rejections - 35 USC § 103

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

19. The factual inquiries set forth in Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

20. **Claims 5, 7, 9, 12-14 and 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagahama et al. as applied to claims 1 above as can be understood since claims 1, 3-9 and 11-22 have been rejected under 35 U.S.C. 112.

21. Regarding **claim 5**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, wherein the at least one layer (second layer of 5; paragraph [0073]) made of the second nitride compound semiconductor material ($Al_YGa_{1-Y}N$ ($0 \leq Y \leq 1$); paragraph [0074]) has a thickness of a

range of 1 nm to 10 nm (10 angstroms to 100 angstroms; paragraph [0076]) which overlaps claimed range of 10 nm to 100 nm, and establishes a prima facie case of obviousness (MPEP 2144.05).

22. Regarding **claim 7**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, wherein the second nitride compound semiconductor material is $Al_xGa_{1-x}N$ where $0 \leq x \leq 1$ (paragraph [0074]) which overlaps the claimed range of $0.1 \leq x \leq 0.2$, and establishes a prima facie case of obviousness (MPEP 2144.05).

23. Regarding **claim 9**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, wherein the first and second nitride compound semiconductor materials ($In_XGa_{1-X}N$ ($0 \leq X \leq 1$) and $Al_YGa_{1-Y}N$ ($0 \leq Y \leq 1$)) are p-doped (paragraph [0073]).

Nagahama et al. do not teach the first and second nitride compound semiconductor materials are n-doped.

It would have been an obvious matter of design choice to have the first and second nitride compound semiconductor materials n-doped, since the device can perform equally well with all the doping changing their polarity, which is well known in the field of semiconductor manufacturing.

24. Regarding **claim 12**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, wherein at least one edge length (horizontal length in Fig. 1) of the main area (the top surface of 7).

Nagahama et al. do not teach wherein at least one edge length of the main area is 400 μm or more.

Parameters such as the one edge length of the main area in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device performance such as the total output power during device fabrication. Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to incorporate the one edge length of the main area within the range as claimed in order to achieve desired total output power.

25. Regarding **claim 13**, Nagahama et al. also teach the thin-film LED as claimed in claim 12, wherein at least one edge length (horizontal length in Fig. 1) of the main area (the top surface of 7).

Nagahama et al. do not teach wherein at least one edge length of the main area is 800 μm or more.

Parameters such as the one edge length of the main area in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device performance such as the total output power during device fabrication. Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to incorporate the one edge length of the main area within the range as claimed in order to achieve desired total output power.

26. Regarding **claim 14**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, the thin-film LED (Fig. 1).

Nagahama et al. do not teach wherein operation of the thin-film LED with a current intensity of 300 mA or more is provided.

This limitation is considered as "intended use". It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex Parte Masham, 2 USPQ F.2d 1647 (1987).

27. Regarding **claim 16**, Nagahama et al. also teach the thin-film LED as claimed in claim 1, wherein a portion of the total area of the main area (the top surface of 7) is covered by the first contact layer (8).

Nagahama et al. do not teach wherein less than 15% of the total area of the main area is covered by the first contact layer.

Parameters such as the percentage of the total area of the main area covered by the first contact layer in the art of semiconductor manufacturing process are subject to routine experimentation and optimization to achieve the desired device performance during device fabrication. Therefore, it would have been obvious to one of the ordinary skill in the art at the time the invention was made to incorporate the percentage of the total area of the main area covered by the first contact layer within the range as claimed in order to achieve desired device performance.

28. **Claims 17-20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagahama et al. as applied to claim 1 above, and further in view of Nozaki et al. (US 5,744,828 A) as can be understood since claims 1, 3-9 and 11-22 have been rejected under 35 U.S.C. 112.

Nagahama et al. teach, regarding to **claim 17**, wherein the first contact layer (8) has a lateral structure (see Fig. 1) comprising a contact area (the interfacial area between 7 and 8; see

Fig. 1), and regarding to **claim 18**, the contact area (the interfacial area between 7 and 8; see Fig. 1).

Nagahama et al. do not teach, regarding to **claim 17**, wherein the first contact layer has a lateral structure comprising a plurality of contact webs, regarding to **claim 18**, wherein the contact area is surrounded by at least one frame-type contact web, the frame-type contact web being connected to the contact area by means of at least one further contact web, regarding to **claim 19**, wherein the frame-type contact web has a square, rectangular or circular form, and regarding to **claim 20**, wherein the number of frame-type contact webs is one, two or three.

In the same field of endeavor of LED, Nozaki et al. teach, regarding to **claim 17**, wherein the first contact layer (excitation electrode 20; Fig. 1, col. 3 line 58) has a lateral structure (see Fig. 1) comprising a plurality of contact webs (current supply electrode 22; Fig. 1, col. 3 lines 60-61), regarding to **claim 18**, wherein the contact area (bonding pad 21; Fig. 1, col. 3 line 60) is surrounded by at least one frame-type contact web (current supply electrode 22; Fig. 1, col. 3 lines 60-61), the frame-type contact web (22) being connected to the contact area (21) by means of at least one further contact web (straight lines 22a; Fig. 1, col. 4 line 14), regarding to **claim 19**, wherein the frame-type contact web (22) has a square, rectangular or circular form (square form; see Fig. 1), and regarding to **claim 20**, wherein the number of frame-type contact webs (22) is one, two or three (three; see Fig. 1).

It would have been obvious to one of ordinary skill in the art at the time of invention was made to combine the inventions of Nagahama et al. and Nozaki et al. and use the frame-type contact web as taught by Nozaki et al., because the frame-type contact web lets the device

uniformly emit light, to thereby improve the light emission efficiency of the device as taught by Nozaki et al. (col. 5 lines 12-16).

29. **Claim 21** is rejected under 35 U.S.C. 103(a) as being unpatentable over Nagahama et al. as applied to claim 1 above, and further in view of Schubert (US 2003/0111667 A1) as can be understood since claims 1, 3-9 and 11-22 have been rejected under 35 U.S.C. 112.

30. Regarding **claim 21**, Nagahama et al. also teach the first contact layer (8).

Nagahama et al. do not teach wherein a second contact layer, which reflects the electromagnetic radiation emitted by the active layer, is provided on a side of the active layer opposite to the first contact layer, the first contact layer having a contact area and the second contact layer having a cutout in a region opposite the contact area.

In the same field of endeavor of LED, Schubert teaches wherein a second contact layer (ohmic contacts 182 and reflective film 184; Fig. 8, paragraph [0029]), which reflects the electromagnetic radiation (paragraph [0029]) emitted by the active layer (emitting region 124; Fig. 8, paragraph [0024]), is provided on a side (bottom side) of the active layer (active region 120; Fig. 8, paragraph [0024]) opposite to the first contact layer (top contact 109; Fig. 8, paragraph [0024]), the first contact layer (109) having a contact area (the contact area between 109 and 160) and the second contact layer (182 and 184) having a cutout (central portion 185) in a region (185) opposite the contact area (the contact area between 109 and 160; see Fig. 8).

It would have been obvious to one of ordinary skill in the art at the time of invention was made to combine the inventions of Nagahama et al. and Schubert and use the ohmic contacts as taught by Schubert, because the ohmic contacts increase the portion of the light that reaches and

is reflected by the underling reflective film and also increase the light extraction efficiency as taught by Schubert (paragraph [0029]).

Response to Arguments

31. Applicant's amendments, filed 10/07/2010, overcome the objections to the drawings and the rejections to claims 1-9 and 11-21 under 35 U.S.C. 112. The objections to the drawings and the rejections to claims 1-9 and 11-21 under 35 U.S.C. 112 have been withdrawn.

32. Applicant's arguments with respect to claims 1 and 3-22 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

33. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsin-Yi (Steven) Hsieh whose telephone number is 571-270-3043. The examiner can normally be reached on Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on 571-272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Lynne A. Gurley/
Supervisory Patent Examiner, Art Unit 2811

/H. H./
Examiner, Art Unit 2811
1/15/2011